

# Noble Metal-free Electrocatalysts for Oxygen Reduction Reaction

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As an alternative to the precious Pt-based catalysts, highly active noble metal-free electrocatalysts for oxygen reduction reaction (ORR) hold great promise for clean and renewable energy systems. Herein, controllable preparation of series of noble metal-free ORR catalysts (including ultrathin MoS<sub>2</sub> nanosheets incorporated with heteroatoms, as well as small nanoparticles of transition metal carbides supported on N-rich graphene) are accomplished via in-situ pyrolysis of small molecule precursors. Detail physical characterization and investigations on ORR catalysis are performed. Engineering P atoms into the plane of MoS<sub>2</sub> nanosheets and entrapping small iron carbide nanoparticles into 3D framework of N-rich graphene demonstrate efficient catalysis towards ORR.

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